INVOLVEMENT OF FOODSERVICE ESTABLISHMENTS IN SHORT FOOD SUPPLY CHAINS: ORGANISATIONAL MODELS IN SLOVAKIA

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Abstract
In recent years, overseeing food systems has become a significant worldwide issue due to the climate crisis, biodiversity loss, and unhealthy diets. Short food supply chains are replacing conventional global supply systems by encouraging local and direct exchanges between consumers and producers. These systems provide urban areas with access to fresh, high-quality food while fostering community interaction and trust between producers and consumers. The food service sector acts as a key intersection in these regionalized systems by promoting local foods to customers and connecting with farmers and distributors. The article explores the involvement of food service establishments in regional food systems in Slovakia focusing on their organizational models. The presented outputs are part of a broader research aimed at exploring the potential of SFSC for the development of food service establishments. The research uses part of the primary data collected through an online questionnaire survey in Slovak food service establishments. Given the complex nature of SFSC and the largely unique nature of potentially created alternative food networks, our research design combines quantitative and qualitative methods. We used cluster analysis to identify and classify the forms of establishment involvement in SFSCs and to identify those more complex structures of regionalized food systems in Slovakia. Based on hierarchical clustering with Ward's minimum variance approach, 5 clusters that represent different models of involvement of food service establishments in SFSCs within regionalized food systems in Slovakia were profiled. Results show that an intermediary (local food center) can significantly support the involvement of food service establishments in the SFSC and take over the coordination of communication and logistics between farmers and food service establishments

in the territory. There are several studies on SFSC in the literature, but only a few deal with the involvement of food service establishments. The article examines the interest of Slovak food service establishments to participate in SFSCs, the existence of various organizational models of the SFSC involving establishments, and the challenges they are facing. At the same time, it opens up possibilities for a more detailed examination of the benefits and barriers perceived by food service establishments when participating in the SFSC.

Key words
Short food supply chain, local food system, food service establishment, organisational model, food distribution system.

INTRODUCTION

In recent years, effectively managing food systems has become a major global challenge driven by the climate crisis, land degradation, worsening water quality, biodiversity loss, and the growing expansion of unhealthy diets (Rockström et al. 2020). Short food supply chains offer an alternative model to traditional global supply chains within agri-food systems. This model emphasizes local direct transactions between consumers and producers avoiding the lengthy networks and intermediaries typical for conventional global supply chains. Such systems include direct sales from farmers to nearby local retailers or consumers (Bakos 2017).

While short food chains may not fully replace global food systems, they offer numerous advantages. Local food systems help tackle urban challenges connected with access to high-quality and fresh food. Socially oriented short food chains enhance trust, interaction, and community cohesion and foster a closer link between production and consumption. They also contribute to knowledge sharing, which encourages changes in consumer behavior. Most importantly, they play a crucial role in building connections and trust between producers and consumers (Križan 2022). An important reason for supporting local food chains alongside global value chains in the agri-food sector is the environmental advantage of local food systems (Lochman, Vágner 2022). These systems contribute to soil preservation, biodiversity protection, and efforts to mitigate climate change (Edwards-Jones et al. 2008). Additionally, local food systems benefit local economies by boosting income and creating new jobs (Aguiar 2018; Falguieres 2015). These systems offer rural farmers opportunities for economic diversification, leading to higher incomes, better living standards and innovations in organization, processes and products or services. Such innovations can expand across various activities, support tourism development and enhance the region's image. In urban areas, food communities or health-focused groups benefit from the availability of fresh food (FAAN 2010). Consumer benefits within SFSC include obtaining important information and motivation driven by product quality (Lombardi et al. 2015; Stanco et al. 2019).

In these localized systems, the food service sector can play a pivotal role by fostering greater importance in local food among farmers, customers, and potential distributors. Key locations within the network are frequently linked to the growth

of supplementary activities such as gastro tourism, agrotourism and adventure tourism (Laginová et al. 2023). Numerous studies in the academic literature examine the advantages and disadvantages related to local food sourcing by food service establishments. The authors identify several key benefits including support for the local community and economy, safer and fresher food, superior product taste, improved public relations and increased customer satisfaction (Dougherty et al. 2013). Additional advantages include the ability to buy smaller quantities, reduced energy and transport costs, awareness of the origin and methods of production of products, natural food quality and environmental advantages resulting from the reduced distances between farms and food service establishments (Khan, Prior 2010).

OBJECTIVES

This article examines the implications and dynamics of regionalized food supply chains in relation to foodservice establishments within Slovakia. The research questions are articulated as follows:

1. To what degree and in what ways do food service establishments engage in regional and local food systems in Slovakia?
2. What is the structure and organizational model of short food supply chains in which food service establishments participate?

SHORT FOOD SUPPLY CHAINS AND LOCAL FOOD SYSTEMS

There are multiple definitions of SFSCs based on different criteria including the distance, amount of intermediaries, social interactions, knowledge exchange, location, and participation in governance (Jarzębowski et al. 2020). In general, short food supply chains (SFSCs) are defined as supply chains that involve a minimum amount of intermediaries. In the case of direct sales, they do not even include any intermediate link between the producer and the consumer. SFSCs were defined for the first time in the framework of the EU rural development policy for 2014-2020 as supply chains that involve a limited amount of economic actors that are ready to cooperate, support local economic growth and maintain close social and geographical ties among food producers and consumers and processors. Many authors have highlighted the numerous advantages brought by SFSC in the economic, social and environmental fields but also about possible barriers and opportunities for the development of SFSC (Coelho de Souza et al. 2021; Enthoven, Van den Broeck 2021; Jarzębowski et al. 2020). Products (Branding and Labelling, Valorization, Value), governance (external and internal), organizational/institutional systems (Networking, Cross-learning, Process Innovations), and sales (efficiency, diversity, and connection) are currently considered to be significantly discussed topics in connection with the SFSC (Jarzębowski et al. 2020).

Compared to SFSC, the definition of local food system (LFS) is more difficult. There is no unified consensus among the experts about what can be considered "local" or what creates a LFS. Most definitions focus on the general concept of the origin of local food (Dunne et al. 2014; Roy, Ballantine 2020) emphasizing the distance between the production site and the point of sale (Augère-Granier 2016). The geographical definition of LFS, which can be perceived differently for different types of food - from the local through the regional to the national level, is important. According to a report by the Joint Research Center (2013), a LFS is characterized by food being produced, processed and sold within a specific geographical area, typically within a radius of 20 to 100 km, depending on the source. In addition to spatial proximity (actual distance between food consumption and production), a LFS may also rely on relational proximity (e.g. strong connections between participants in the food system) and value of proximity (e.g. considerations of origin, freshness, traceability and quality). Local food is also a subjectively understood term and there is no unified definition of what constitutes local food. How the term "local" is understood depends on the context. Nummedal, Hall (2006) perceive local foods and beverages as specialties that have a local identity, including locally produced and regionally branded products. These include not only locally grown products but also raw materials originating from another area processed locally, thereby acquiring a local or regional identity (Matlovičová 2024). Hall et al. (2013), Roy, Ballantine (2020) state that despite the lack of a consistent definition of 'local food', it remains a significant part of promotion, purchasing, food branding and comprehension. The preparation of meals from local ingredients, the use of autochthonous varieties of fruits and vegetables as well as craft techniques in preparing meals are important gastronomic trends in restaurants (Pellešová, Vacha 2023), attracting more and more customers. At the same time (Lochman, Vágner 2021) also draws attention to the risks associated with a high concentration of catering establishments in tourism destinations (e.g. reduction of the area of agricultural land, food consumption, high intensity, etc.) and their limited impact on the sustainable development of the territory.

TYPOLOGY OF SHORT FOOD SUPPLY CHAINS AND LOCAL FOOD SYSTEMS

Researchers and practice (Chiffoleau, Loconto 2018; Bertazzoni et al. 2020; Jarzębowski et al. 2020; Kneafsey et al. 2013; Laginová et al. 2023) have identified different types of SFSCs and use different classifications that take into account the number actors involved in SFSC on the side of producers or consumers (individual direct sales, collective direct sales or partnerships), relationships between them (formal/informal, binding/non-binding, personal/mediated, etc.), different organizational models and food distribution channels (farm direct sales, box sales, farm stores, farmers markets, community supported agriculture, online food sales,

etc.). Augère-Granier (2016) distinguishes between traditional and neo-traditional SFSC. *Traditional SFSC*s are typically based on farms in rural areas and often involve on-farm sales through farm shops, mobile sales and pick-your-own systems, and producer markets. These chains are usually managed by farming families and often utilize traditional and artisanal techniques. In contrast, *neo-traditional SFSCs* are more intricate systems that comprise cooperative networks of producers, consumers, and institutions while often striving to preserve traditional agricultural practices through innovative models and social changes. Examples consist of: supply schemes, urban farm shops and collectively owned farming systems, typically situated in urban areas or on the city's outskirts. They are considered to be local food movements often driven and supported mainly by urban inhabitants.

The majority of authors describe SFSCs as the main type of distribution channels applied in LFS. A characteristic feature is the reduced number of intermediaries between producers and consumers. Nevertheless, it is necessary to distinguish between SFSC and LFS because SFSC does not have to be local and LFS does not necessarily include SFSC (Enthoven, Van den Broeck 2021). Within the SKIN (Short Supply Chain Knowledge and Innovation Network) project, the authors distinguished LFS (operating based on SFSC) into three categories: local food systems, hyperlocal food systems and ultralocal food systems. The traditional definition of SFSC encompasses actors operating in *local* food systems, typically situated in rural areas near a larger city or town, who seek to enhance their income by functioning as both processors and retailers (Jarzębowski et al. 2020). Enthoven, Van den Broeck (2021) highlighted the region's potential for self-sufficiency that could be attained by aligning agricultural practices with local and regional requirements and encouraging dietary choices towards regional and local products. *Hyperlocal* food systems encompass SFSCs typically situated in rural areas close to cities and typically engage in production, processing and marketing. This broader perspective also includes traditional urban farming activities aimed at producing fresh fruits and vegetables that have been enhanced through technological advancements (Jarzębowski et al. 2020). *Ultralocal* food systems cover hobby gardens which often provide individuals with ample food to cultivate for personal consumption, to share with neighbors, or to sell at small markets. Many cities and towns endorse this practice not only as a strategy for food security but also as a means to enrich community life by fostering connections among neighbors (Jarzębowski et al. 2020).

Distribution channels in LFS are organized in different ways, based on different types of sales agreements among producers and buyers, the forms of interaction between consumers and producers and the varying levels of consumer commitment (Enthoven, Van den Broeck 2021).

Fig. 1 Local food distribution channels
Source: Self-elaborated based on Enthoven and Van den Broeck (2021)

Enthoven, Van den Broeck (2021) divided LFS into three groups (figure 1). *The first group* consists of direct sales to the consumer and is also one of the forms of SFSC. The group includes sales through farmers' markets, on-farm sales, delivery sales (boxes, cases, pick-up point) and community supported agriculture. In this LFS, sales are carried out for standard prices, based on agreements between the producer and the buyer on the spot market or repeatedly based on a mutual agreement for standard prices or based on contracts for future repeat sales. Direct sales are based on a personal or close relationship, a so-called face-to-face interaction between producer and consumer (Holloway, Kneafsey 2000; Pretty 1998). The consumer undertakes to purchase food only in case of delivery sales and community supported agriculture. In other cases of LFS, the consumer's commitment to the producer is low. *The second group* of LFS are direct retail SFSCs. Sales in this group are made through consumer retail cooperatives, local independent retailers, restaurants, other foodservice establishments, and institutions like schools and hospitals (Marsden et al. 2000; Renting et al. 2003; Schönhart et al. 2009). These SFSCs are based on mutual formal contracts between producers and buyers. They do not involve interaction with the consumer. They assume production and sales in the same place. According to Banks (2001), in this group of LFS, the most common cooperation occurs among producers who, for instance, broaden their offerings by exchanging products between farm shops or by combining individual items under a regional quality brand. LFS are primarily based on spatial proximity with products being sold in the region (or area) where they are produced, and consumers (including tourists) being made aware of the "local" characteristics of the product at the retail site. *The third group* of SFSCs, according to the authors Enthoven, Van den Broeck (2021), is represented by supermarkets and large food retailers who, despite being considered conventional supply chains, also acquire local food. Several international supermarket chains declare their commitment to local farmers and have formal mutual agreements with them to sell their products. Interactions between the producer and the consumer can be spatially extended. It means that consumers also buy foods that

are not produced locally, but their origin and producer are indicated as regional brands. These global networks can still be considered "short" food supply chains: the crucial factor is not the distance the product travels, but rather the valuable information it carries when it reaches the consumer, such as details printed on the package or communicated at the point of sale. This allows consumers to connect with the place of production and possibly with the values of the individuals involved and the methods used in production (Whatmore, Thorne 1997).

The image of products and the production area (Place Image) Matlovičová (2024) are key aspects for building LFS, strengthening trust between farmers and restaurant operators and for their motivation to buy local food. These are often more important than other objectively non-existent attributes because place identity and place image add value to local production. From the point of view of effective management and sustainability of the SFSC, marketing communication and branding of individual actors, as well as production and consumption locations, are important in increasing the bargaining power of the associated actors.

FOOD SERVICES IN LOCAL FOOD SYSTEMS

Businesses providing catering services (restaurants, buffets and catering companies) that operate in the field of food and beverage production and distribution also have their place in SFSC and LFS. These food establishments represent actors in the food system and create an aggregate demand for larger volumes of food compared to individual household consumption (Paciarotti et al. 2022; Pugas et al. 2023, Malachovský 2021). The growth in the volume of demand for food produced within the SFSC simultaneously supports the expansion of food production by local or regional producers and creates more space for the adaptation of more farms to a more sustainable way of production. Hyland, Macken-Walsh (2022) point to the involvement of foodservice establishments in SFSC using the example of a social network in the Kempen region (Belgium). This network is based on connecting farmers (producers) with businesses such as retail stores, hotels, foodservice establishments, and specialized stores and farm shops through the food center "Distrikempen", which serves as an important intermediary between the mentioned entities. The benefits of cooperation between farmers and restaurants with a local food center are also pointed out by Paciarotti et al. (2022). They see the local food center as a "hub" and transshipment platform where food products from various suppliers are received and consolidated and then delivered to restaurants.

Enthoven, Van den Broeck (2021) consider foodservice establishments as an important part of local food systems, which are based on a contractual basis between producer and establishment and close interaction between producer and consumer. Roy et al. (2017) emphasize the importance of personal relationships and building trust between farmers and restaurant operators for their motivation to buy local food. Pugas et al. (2023) addressed in their case study in Florianópolis (Brazil)

the potential and conditions for the involvement of foodservice establishments in SFSC initiatives. The research showed that foodservice establishments consider the affordable price of products (42%), delivery guarantee (26%), product quality (22%), the need for delivery to the place or close to the business (19%), and adequate payment to be necessary conditions for participation in SFSC conditions (16%). Restaurants and chefs play a crucial role in the food distribution system allowing them to foster greater interest in local foods among their customers as well as the farmers and distributors from whom they source their products (Roy, Ballantine 2020). Restaurants generally align with consumers on the primary advantages of purchasing local food: strengthening the local economy and community, enjoying fresher and safer food, experiencing superior taste, maintaining good public relations and achieving higher customer satisfaction. Additionally, they appreciate the ability to purchase smaller quantities, reduced transportation distances and lower energy consumption, as well as having knowledge of product origins and production methods. They also perceive the cost savings, natural quality of food and environmental benefits resulting from a shorter distance between farms and restaurants (Roy, Ballantine 2020). For farmers, the inclusion of restaurants in the LFS, in addition to increased sales of their products in terms of quantity and price also means the opportunity to sell food with a short shelf life, which would otherwise expire during the seasonal period.

Managing LFS (involving farmers and restaurants) is challenging. Some studies report that communication problems arise between farmers and restaurants and point to a lack of knowledge about the availability of local products (Paciarotti et al. 2022; Sharma et al. 2014). Other authors draw attention to the restricted availability of local products regarding both quantity and variety throughout the year (Kang, Rajagopal 2014) and logistical problems. These are mainly related to the transportation of small volumes of food, the required high frequency of deliveries, the large number of recipients and the irregularity of distribution (Paciarotti et al. 2022). Solving these problems requires choosing the right LFS model or optimizing the existing model. Paciarotti et al. (2022) in their research examine different SFSC models involving restaurants from a logistics point of view. They divide the SFSC models with the participation of restaurants into two groups. The first group is represented by a model based on a direct farmer-restaurant relationship (or with the involvement of a virtual platform that ensures communication of orders between farmers and restaurant operators). Two logistics scenarios are included in this group: "transportation of products is provided by producers who deliver to restaurants that have ordered from them" and "transportation of products is provided by restaurants that collect products from producers that they have ordered from". The second group is represented by various forms of SFSC (authors mention scenarios) involving the local food center (intermediary). The local food hub provides logistics services to all participating farmers and restaurant operators.

Scenario a) represents the transport of products from farms to the food center by farmers and transport from the food center to restaurants by restaurant operators. In *scenario b)* the collection of food from farmers is ensured by the food center, and the restaurant operators pick up the products at the center individually. In *scenario c)* the situation is the opposite – farmers transport products from the farm to the food center individually, and the food center will ensure delivery of the products from the center to the restaurant. In *scenario d)* product distribution is provided both ways by the food center. Based on the simulation of different situations (number and structure of actors, their geographical distance, location of the food center), the authors identify the optimal food distribution system in the SFSC. Despite the obvious benefits resulting from the involvement of foodservice establishments in SFSC, few studies (Pugas 2023) deal with this issue in the professional literature, especially the involvement of privately owned businesses in SFSC.

DATA AND METHODS

This study aimed to identify the forms of involvement of foodservice establishments in SFSCs and to explore more complex cooperative structures as the basis for regionalized foodservice systems in Slovakia. The research utilizes part of the primary data collected using an online questionnaire survey involving Slovak foodservice establishments. Considering the complex nature of SFSCs and the largely unique character of potentially established alternative food networks, our research design combines elements of quantitative and qualitative methods. The questionnaire survey was designed to capture experiences emerging from the foodservice establishment perspectives regarding their involvement in SFSC, the cooperative structures that influence these supply chains, perceived benefits and barriers and the motivations behind their participation.

We utilize cluster analysis to identify and classify potential local food system structures and related foodservice establishment forms of SFSC involvement. Cluster analysis results are confronted with answers of the respondents to open-ended questions describing the supplier-customer structures in which they are involved and their functioning. Based on these findings, we define the organizational models of short food chains in the conditions of Slovakia. Utilized data is part of a more broadly formulated questionnaire survey aimed at mapping the involvement of commercial foodservice establishments in short food chains, identifying cooperative structures of local food networks and hypothetical interest of foodservice establishments in sourcing local foods in the conditions of Slovakia. The survey included open-ended questions to enable respondents to provide detailed accounts of their involvement and the cooperative frameworks in which they operate. We utilize data on the foodservice establishment (establishment location, engagement in agricultural production or agro-tourism services), the structure of the existing supply chain (existing suppliers, logistics capabilities) and

involvement in SFSCs. The questionnaire survey was distributed to food service establishments across Slovakia with contact information sourced from a publicly accessible online database of such establishments. Out of 3,876 email addresses, 832 were invalid. The questionnaire was refined after consultations with 3 experts on tourism, gastronomy, and the food industry. The questionnaire was distributed electronically through the Google Forms service. The data was collected from March 2024 to May 2024. The questionnaire was filled out correctly by 158 respondents. Considering the valid email addresses, the response rate was 5.19%.

To assess the representativeness of the full dataset (n=158) (Tab. 1), we consider the population to be the number of establishments listed in the online database of foodservice establishments. In terms of regional distribution, the sample overrepresents the Nitra region while underrepresenting the Bratislava and Košice regions. The representativeness in other regions varies but is generally closer to the population distribution. For the size of establishments, data for the population at the establishment level were not available, so we used data from the Slovak Register of Economic Subjects, specifically for establishments whose main activity is Accommodation and Food Services. The survey sample shows a bias in the size distribution of establishments with a substantial overrepresentation of

Tab. 1 Characteristics of the sample

	Sample (n=158)	Population
Number of employees		
0 to 9 employees	48,41%	94,20%
10 to 49 employees	49,68%	5,31%
50 to 249 employees	1,91%	0,45%
250 and more employees	0,00%	0,04%
Regional distribution		
Banskobystrický	14,56%	13,48%
Bratislavský	5,70%	15,51%
Košický	3,16%	11,42%
Nitriansky	38,61%	12,05%
Prešovský	7,59%	13,40%
Trenčiansky	10,13%	11,45%
Trnavský	10,13%	8,97%
Žilinský	10,13%	13,71%
Municipality		
Urban	67,72%	81,66%
Rural	32,28%	18,34%

Source: own processing (2024)

organizations with 10 to 49 employees. However, the population in this case may not reflect the specific situation of foodservice establishments, and we assume that the size category of 10 to 49 employees is characteristic for this type of establishment.

Cluster analysis

Cluster analysis was applied as a tool to identify and classify the forms of involvement of establishments in SFSCs, and to identify the structures of regionalized food systems in Slovakia. The basis for the cluster analysis was the respondents of the questionnaire survey involved in SFSCs. Although the questionnaire included several questions outlining the forms of involvement in SFSCs, the criterion was the mention of at least one specific regional supplier. This was justified by the importance of identifying the location and type of supplier, as the distance of the foodservice establishment to suppliers was considered a crucial factor defining the SFSC operating model. For the suppliers specified in the survey, it was manually verified whether they could be considered part of the SFSC. Out of 276 specified suppliers, 140 were excluded. These were suppliers within global supply chains (primarily conventional wholesalers and retail chains) and businesses that could not be identified. In 16 cases, the description confirmed that it was a regional supplier, but their trade name and location were not provided. At least one regional supplier was identified for 70 foodservice establishments, and these observations formed the dataset for the cluster analysis. Based on the literature, the classification factors were population density in the location of the establishment, involvement in own agricultural activities, median distance to regional suppliers, type of suppliers, form of involvement in SFSC, and capability of using own transport vehicles. The distance between establishments and suppliers was calculated using *osmnx* and *networkx* Python packages, using OpenStreetMap street networks as the shortest distance via the road network. An overview of cluster analysis variables is presented in Tab. 2. Descriptive statistics for the included variables are presented in Tab. 2.

The analysis was conducted in R software, using the *cluster* package (Maechler et al. 2023). Since the dataset contains mixed data types, we used Gower distance (Ranalli, Rocci 2021). Hierarchical clustering with Ward's minimum variance method was chosen due to its ability to create well-separated clusters and its suitability for smaller datasets (Jaeger, Banks 2023). Due to the skewness of the data distribution for *pop_density* and *median_distance*, we log-transformed these indicators. The data were standardized. The dataset did not contain any missing data. The optimal number of clusters was selected based on multiple methods using a consensus-based algorithm with the *NbClust* package (Charrad et al. 2022). The majority of methods (23.08%, 6 out of 26) recommended choosing either 2 or 5 clusters. To provide a deeper understanding of the establishment's SFSC involvement patterns, we opted for 5 clusters as the optimal number.

Tab. 2 Overview of cluster analysis variables

Variable name	Description	Type	Source
ln(pop_density)	Population density at the municipality level. Log transformed	continuous	Statistical Office of the Slovak Republic (2024)
agro_production	1 = The establishment engages in its own agricultural production or offers agro-tourism services.	binary	survey
ln(median_distance)	Median distance of the establishment to local suppliers via road network in km. Log transformed	continuous	survey, own calculation
supplier_producer	1 = The establishment obtains products from at least one supplier classified as an SFSC producer.	binary	survey
supplier_processor	1 = The establishment obtains products from at least one supplier classified as an SFSC processor.	binary	survey
supplier_intermediary	1 = The establishment obtains products from at least one supplier classified as an SFSC intermediary.	binary	survey
sfsc_farm_gate	1 = The establishment obtains products through farm gate sales and self-picking	binary	survey
sfsc_fm_shop	1 = The establishment obtains products through farmer's market shops.	binary	survey
sfsc_local_market	1 = The establishment obtains products through local markets.	binary	survey
own_transport	The ability of the establishment to use its own vehicles for transporting SFSC-related inputs (0-4 scale)	ordinal categorical	survey

Source: own processing (2024)

RESULTS AND DISCUSSION

Profile of foodservice establishments and their involvement in the regional and local food system in Slovakia

In the case of the full dataset (n=185), most foodservice establishments focus on Slovak cuisine (75.3%) and Central European cuisine (45.6%), reflecting the local culinary tradition. Other popular cuisines include Italian and American, featured in 34.2% and 20.3% of the establishments, respectively. The employed communication strategies to attract customers mainly focus on a favorable price-quality ratio (81.6%). A comprehensive menu offering is the next most common strategy,

adopted by 39.2% of the restaurants. Traditional cuisine is featured in the communication strategy of 34.2% of the establishments, followed by an authentic dining experience using local ingredients (19.6%). Regarding the target groups of establishments, the largest group is individuals with any income level (81.0%). Families with children are another significant target group (65.8%). Young people are targeted by 59.5% of the establishments.

We identified 136 specific foodservice establishments and suppliers that have the character of short food supply chains. Outside of the identified pairs, respondents in 21 cases refused to mention specific suppliers. The reason was that there were various forms of sourcing from small growers or individuals selling surplus production and operating outside the "system." Legislative and hygienic conditions for local sourcing in Slovakia are strict, creating room for the informal economy. Therefore, we assume that a significant share of deliveries with the character of short food supply chains in Slovakia is carried out outside of official records.

Among the identified suppliers, most are producers (63.97%), with processors and intermediaries being less numerous (22.79% and 13.24%, respectively). Most distances to producers are relatively short (figure 2), with many values clustering below 50 km. However, there are several outliers with very long distances, indicating that some producers are located quite far from the establishments they supply. Compared to producers, processors tend to be located relatively closer to foodservice establishments. This could be due to the more centralized nature of processing facilities, which might be strategically located to serve multiple restaurants efficiently. Intermediary distances suggest a bimodal distribution, with a cluster of short distances below 50 km and several much larger distances. There are a few significant outliers with intermediary distances extending beyond 200 km, indicating that some intermediaries operate at a considerable distance from the foodservice establishments. The presence of intermediaries located far away might indicate that these entities aggregate products from various producers and distribute them over larger distances, potentially to ensure a diverse supply of products. The spatial distribution of the analysed pairs of foodservice establishments and their suppliers is shown in figure 2.

Involvement of foodservice establishments in various forms of short food supply chains is shown in figure 4. A significant portion of establishments (32.0%) source their ingredients directly from farm gates. Nearly a third of the establishments (31.1%) obtain their inputs from farmer's market shops. Similarly, 30.3% of establishments source their produce from local markets. A small percentage of restaurants (4.10%) engage in self-picking. This method of involvement is naturally limited by the type of inputs and influenced by seasonality. It is labour-intensive and time-consuming, especially for larger establishments, they cannot systematically ensure sourcing in this way. Only a small fraction of restaurants

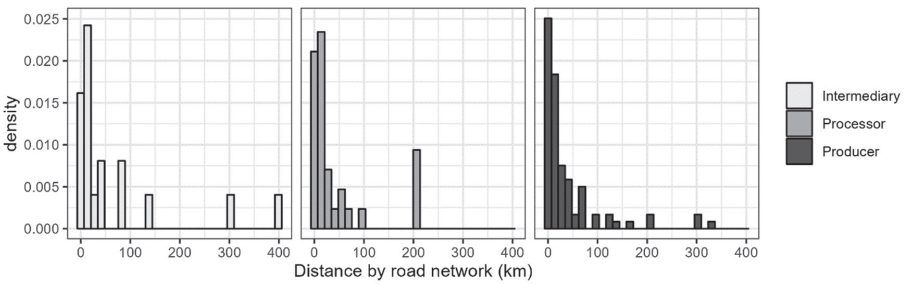

Fig. 2 Distribution of spatial distances to a SFSC supplier
Source: edited by the authors (2024)

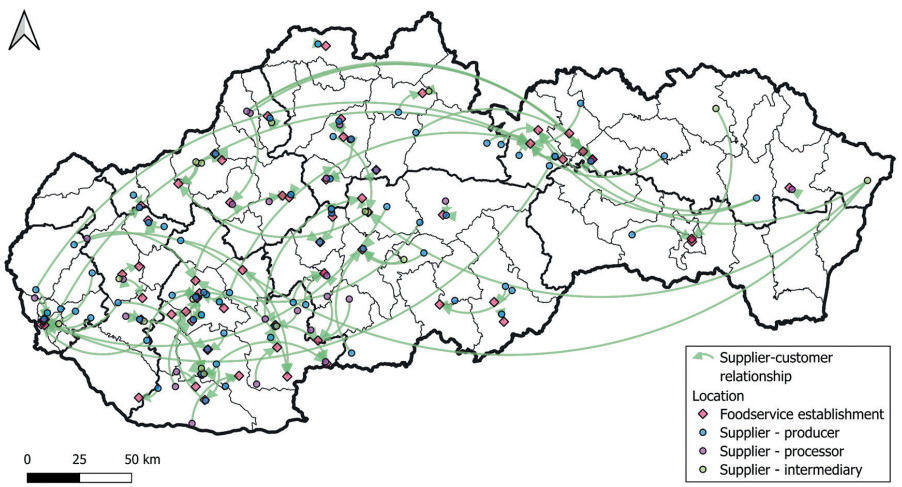

Fig. 3 Spatial distribution and supplier-customer relationships of foodservice establishments and their suppliers
Source: edited by the authors (2024)

(2.46%) use box delivery schemes. The low proportion suggests that this method is not widely adopted, possibly due to logistical challenges or the specific needs of the restaurants not aligning well with this type of delivery. Coordinating deliveries to ensure they align with restaurant schedules can be challenging, particularly for perishable items that require timely delivery. Fixed schedules of these schemes might not align with the dynamic needs of restaurants that may require last-minute supplies. Availability of certain products may be highly seasonal, leading to inconsistency in ingredient supply throughout the year. However, we consider the main reason for the low involvement in this type of short food supply chain to be that such schemes are largely not yet established in Slovakia. A portion of the establishments (17.72%) were involved in multiple forms of food sourcing

within the SFSC. Farm gate sales are frequently combined with other sourcing methods, particularly with local markets (12 co-occurrences) and farmer's market shops (11 co-occurrences). Farmer's market shop is also commonly combined with other methods, especially with local markets (14 co-occurrences). This indicates that foodservice establishments engaging in farm gate sales are versatile in their sourcing strategies. From the perspective of utilizing farmer's market shops, utilizing this form in conjunction with others may contribute to a higher variety of available products.

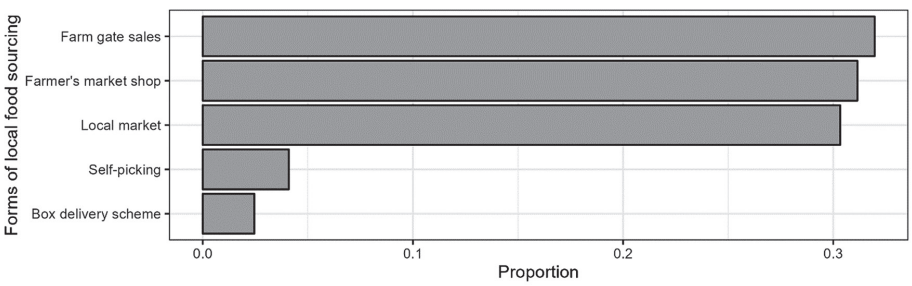

Fig. 4 Involvement of foodservice establishments in SFSC
Source: edited by the authors (2024)

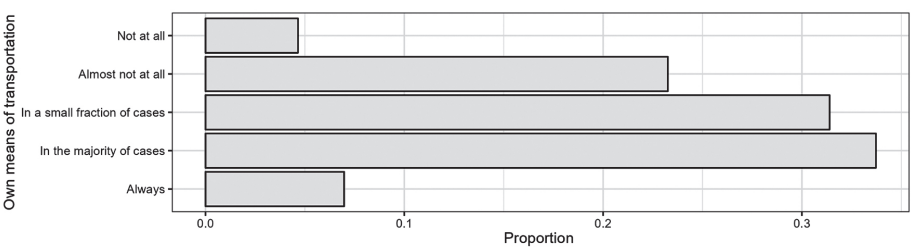

Fig. 5 Capabilities of using own transportation means
Source: edited by the authors (2024)

Foodservice establishments involved in SFSCs (n=86) rely heavily on their own transportation means, with up to approximately 72% of them using their own transportation in at least a small fraction of food deliveries made (figure 5). More than a third of them use their own transportation in the majority of food deliveries made. The higher percentage of establishments involved in SFSC using their own transportation suggests that they cannot rely on established distribution networks provided by larger suppliers and wholesalers. The reliance on own transportation in case of facilities involved in SFSC may reflect the need for flexibility and responsiveness in handling local produce and prioritization of direct control over their supply chains. However, we assume that this indicates the absence of more

comprehensive distribution systems in the form of networks of cooperation among producers, consumers and institutions. It suggests the prevalence of individual direct sales to restaurants, which rely on their own transportation. The inability to ensure own transportation thus appears to be a significant barrier to participating in SFSC under the conditions in Slovakia.

Organisational model of involvement of foodservice establishments in SFSCs

The purpose of cluster analysis was to identify the forms of involvement of foodservice establishments in SFSCs and identify more complex cooperation structures as the basis for regionalized food systems in Slovakia using a subset of 70 establishments with identified SFSC suppliers. Based on hierarchical clustering using Ward's minimum variance method, the analysis resulted in five clusters. The dendrogram and heatmap are shown in figure 6.

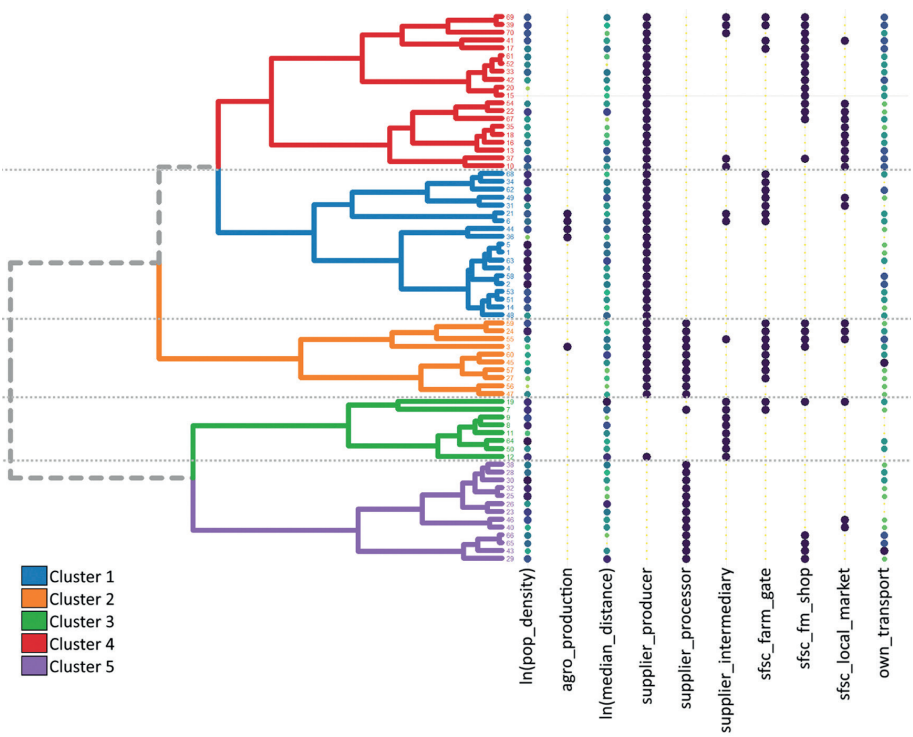

Fig. 6 Cluster analysis dendrogram and heatmap
Source: Self-elaborated based on R software (2024)

Based on the cluster analysis, 5 clusters were identified, which represent different forms of involvement of foodservice establishments in the SFSC within regionalized food systems in Slovakia. These differ from each other in their location, the use of their own food production, the method of involvement in SFSC or organizational model of the SFSC, the distance of the suppliers who supply foodservice establishments and ensuring the transport of products from the supplier to the facilities.

M1 - Model "direct sale farmer-restaurant in the city" (19 establishments)

Foodservice establishments are mainly located in the city. A typical feature of this group is that they buy the local/regional products that they use in the preparation of food and drinks in their establishment directly from the producer (farmer). Some of them grow their own products, have animal production, or provide agro-tourism services. A characteristic feature of the entire group of establishments is the relatively greater distance from the supplier of raw materials for the preparation of food and beverages (more than 24 km in most establishments). None of the establishments buy products from the processor, in farm shops and only a very small part from the intermediaries or at the local market. Part of the facilities uses self-harvesting to ensure the supply of fruit and vegetables. This is the model identified by Paciarotti et al. (2022) as a model of "direct sales from farmer to restaurant" with the use of product transport provided by both the farmer and the restaurant. A greater distance between the supplier and the customer indicates that it is a spatially extended relationship between the producer and the foodservice establishment - the consumption of local products is also realized outside the territory of the location/region (Renting et al., 2003). The group includes innovative enterprises that support social and technological innovations in LFS. An interesting example is LFS based on community supported agriculture. It is a replicable model of a small family farm (2ha) that supplies a closed group of regular customers (including restaurants). The farm uses a special technology for plant care and soil treatment, the so-called agrokruh, is able to produce 24 tons of vegetables per year with a large variety of products. The products are grown by the farmer according to the customer's interest. The circle also symbolizes (in addition to the technological meaning) the matching of supply with demand and the agreement between the farmer and the customer (in our case, a restaurant in the city). A similar example of a functioning LFS is the cooperation of gastronomic enterprises with micro farms, which offer the possibility to subscribe to seasonal boxes of delivered food in regular delivery cycles to the establishment. In addition to food deliveries, they also offer educational excursions, team building, cooking courses, or experiential fine dining. An innovative example of LFS is the supply of a restaurant in the city by a civic association that brings together a community of edible mushroom growers

in an urban environment. The association strives for their popularization and use in gastronomy, science and art.

M2 - Model "direct sale farmer/processor - restaurant in the countryside" (10 establishments)

Foodservice establishments are mainly located in the countryside. A characteristic feature of this group is (similarly to the 1st group) that they purchase local/regional raw materials for the preparation of food and drinks directly from producers but also from processors in the immediate surroundings (within 10 km). The range of food also corresponds to the short distance. The majority of establishments purchase products of regular consumption that require frequent supply (e.g. vegetables, fruit, herbs, meat, milk, eggs, fish, mushrooms, bread and pastries, etc.). In rare cases, especially with commodities such as game or cheese, the distance is longer. This group also uses direct yard sales and/or self-picking. To a lesser extent, establishments also use farm shops and local markets when purchasing raw materials. The owners of establishments of this group boast about the freshness and quality of the ingredients, the prompt deliveries from local farmers and the "above standard" relations with farmers. Supply of products is based on telephone or electronic order and delivery of products is by farmers. In this case, it is the traditional model of direct selling in SFSC (Enthoven, Van den Broeck 2021), which involves actors operating in local food systems, typically located in rural areas near larger towns or cities, aiming to increase their income by functioning as both processors and retailers (Jarzębowski et al. 2020). This group includes gastronomic establishments that buy from farmers who simultaneously fulfill the role of the producer and the processor, and/or have a network of their own retail stores and support the "farm to table" initiative. They use mobile app to support the sale of food by delivery.

M3 - Model "farmer - intermediary - restaurant in the city" (8 establishments)

The foodservice establishments of the 3rd group are mainly located in the city. In the distribution chain, they buy exclusively from an intermediary and they are not food producers (i.e. they do not grow any products and animals). They buy products from more distant suppliers (median 35.7 km). For special products, the distance is greater, exceeding 100 km across the regions of the Slovak Republic (e.g. special syrups, flour, pasta or strudel). For the transport of products from local producers, they do not use their own transport or only in rare cases (for a small part of the products). It is a model using an intermediary (Paciarotti et al. 2022), including large distribution companies (e.g. Dmi TRADING SK s.r.o., CEVA, GTN s.r.o., Gastland s.r.o., Zdravé ovocie s.r.o. and etc). From a spatial point of view, the group of establishments represents the spatially extended relations between the

producer and the foodservice establishment - the consumption of local products is carried out outside the territory of the location/region (Renting et al. 2003). The advantage of this model is ensuring the necessary quantity and range of products, smoothness of deliveries throughout the year and provision of services related to logistics. In countries with developed LFS, the mentioned role is fulfilled by "local food centers". In the examined conditions, local food centers are replaced by widely operating companies (intermediaries), which ensure product promotion, orders (usually via a virtual platform), delivery of ordered products to restaurants but also counseling, lectures or new recipes.

M4 - Model "farmer - restaurant in the countryside"
(20 establishments)

The 4th group of catering establishments are mainly located in the countryside. Their common characteristic is that they mostly buy from the producer in the immediate surroundings (median 11.7 km). They also make intensive use of farm shops and local markets. They do not buy from product processors at all, and they make limited use of an intermediary when purchasing. They use their own transport for the delivery of products. This group of SFSCs is based on face-to-face interaction between producers and foodservice establishments (Holloway, Kneafsey 2000; Pretty 1998) through the use of farmers' markets or farm shops. At the same time, it represents the SFSC group, which Enthoven, Van den Broeck (2021) included in the direct retail SFSC group, which assume production and sales at the same location. Thus, these are local food systems whose producers are usually located in rural areas near a larger town or city, aiming to increase their income by also operating as processors and retailers (Jarzębowski et al. 2020). This group includes foodservice establishments having "close" relations mainly with producers of meat and dairy products (agricultural cooperatives have repeatedly appeared in the group), which distribute products directly on the farm or through ambulatory sales (mobile stores). A distinctive feature of the producers is the distribution of products outside the wholesale market and the declaration of environmentally friendly animal/crop of plant origin, without the use of harmful products.

M5 – Model "farmer - processor - restaurant"
(13 establishments)

The 5th group includes establishments located in both rural and urbanized areas (location does not play a significant role). A common characteristic of the group is that all facilities deliver from a processor of local/regional products. At the same time, they are not food producers themselves and do not buy from an intermediary and do not use yard sales and self-harvest. They only rarely use their own transport for shopping.

CONCLUSIONS

Conducted survey of Slovak foodservice establishments showed that 44% of establishments are involved in SFSC. Foodservice establishments involved in SFSC use various forms (farm sales, farm stores, local markets, self-collection, box sales, etc.) for their supply as well as combinations of the mentioned forms. It is the combination of different raw material procurement strategies for food preparation that points at the diversity of the range of raw materials that restaurants require from producers and the need for communication with different food suppliers. From the comparison of the groups of foodservice establishments involved and not involved in the SFSC, we found several differences related to logistics. Establishments involved in SFSC tend to have more flexible scheduled ordering processes, favour long-term sourcing strategies and have better established supplier relationships compared to non SFSC ones. The ability to ensure supply by own transport is also significantly higher for establishments involved in the SFSC than for establishments that are not involved in the SFSC. On the one hand, this points to their flexibility in supply, on the other hand, it indicates the absence of more complex developed distribution systems (LFS). We used cluster analysis to identify the organizational models of foodservice establishments´ involvement in SFSC.

The result of our research is distinguishing different groups of foodservice establishments involved in SFSC between 5 organizational models (M1 "direct sale farmer - restaurant in the city", M2 "direct sale farmer/processor - restaurant in the countryside", M3 "farmer - intermediary - restaurant in the city", M4 " farmer - restaurant in the countryside", M5 "farmer - processor - restaurant"), which differ mainly in the location of the establishment, the method of involvement in the SFSC, the distance and type of supplier and transport. Models M1 and M4 are based on a close "face-to-face" relationship between producer and restaurant (consumer), as reported by Enthoven, Van den Broeck (2021), Holloway, Kneafsey (2000) and Pretty (1998) with differences in the location of the foodservice establishment and in preferred logistics. M2 represents a model in which the farmer and the processor have a cumulative position or is an intermediate link in the distribution chain between the farmer and the restaurant in the countryside. This group was identified by Jarzębowski et al. (2020) within LFS. Models M3 and M5 also represent SFSCs with an intermediate link in the distribution, which is a processor or intermediary. In both models, restaurants rely on the distribution transport secured by an intermediary. In the M3 model, larger distribution companies also appear as intermediaries, which, despite being linked to conventional supply chains, obtain food locally and declare their commitment to local farmers to sell their products (Enthoven, Van den Broeck 2021; Whatmore, Thorne 1997). They can be considered as a part of the SFSC for the mentioned reason. We believe that the services of a local food center could be an effective support for the building of more complex local food systems with the participation of catering facilities, which in Slovak

conditions, are created only gradually and without greater territorial coordination. Paciarotti, Torregiani (2021) state that these services can be provided without an intermediary (designed according to the characteristics of a cloud computing system) through an online platform. So the actors interact directly within the system - customers have the opportunity to choose the farmers they will buy from and communicate directly with them. The service provider of the local food center will ensure communication and logistics in the LFS. Such a solution brings positive effects to private entrepreneurs (farmers and restaurants) in the form of simplification of communication and logistics as well as to local self-government in the form of valuation of territorial assets, sustainable development of the territory and support for the development of tourism.

The limitations of this research are twofold. The first is the underrepresentation of the Bratislava and Košice regions in the sample, which are major urban centres, potentially containing niche forms of SFSC organisational models. The methodology used to categorize organisational models is also a limitation, as it does not allow for a detailed assessment of the complex and diverse relationships between food service establishments and their suppliers at an individual level.

It is important to note that external factors such as crises in the economic, social, health, environmental, or political spheres can also influence the functionality and reliability of the MPS (Matlovič, Malovičová 2024). These can be the cause of various failures in the MPS such as supply chain disruptions, lack of resources, labour or food price fluctuations. Addressing the problems caused by crises requires the adoption of specific strategies to increase the resilience of the MPS and flexible adaptation of all links of the SFSC i.e. farmers, foodservice establishments as well as consumers. The experience of foodservice establishments gained by overcoming obstacles during crises may influence their motivation to engage in SFSCs in the future Examining their impact and choosing catering establishments' strategies to deal with the impacts of crises and poly-crises is a topic for further research in this area. We also see the potential for further research focused on the involvement of catering establishments in the SFSC in a more detailed examination of consumer behaviour, especially preferences for consuming food prepared with locally sourced ingredients. Local food can be an important attraction factor in gastronomic tourism. Exploring the motivations of visitors to foodservice establishments that are part of the MPS could also be of interest in the Slovak conditions.

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